

Acid Mine Drainage - USGS Publications

Abandoned Mine Lands Initiative; providing science for watershed issues, 1999, P. J. Modreski, compiler, U.S. Geol. Survey Open-File Report 99-0321, 29-30.

Albers, J. P., 1985, Geology of the brick flat massive sulfide body, Iron Mountain Cluster, West Shasta District, California. *Econ. Geol.* 80, 2092-2099.

Alpers, C. N., D. W. Blowes, D. K. Nordstrom, and J. L. Jambor, 1994, Secondary minerals and acid mine-water chemistry. In *Environmental Geochemistry of Sulfide Mine-Wastes*. J. L. Jambor and D. W. Blowes, eds., Mineral. Assoc. Canada Short Course Handbook, vol. 22, 247-270.

Alpers, C. N., and G. H. Brimhall, 1988, Middle miocene climatic change in the Atacama Desert of northern Chile: Evidence from supergene mineralization at La Escondida. *Geol. Soc. Am. Bull.* 100:1640-1646.

Alpers, C. N., and G. H. Brimhall, 1989, Paleohydrologic evolution and geochemical dynamics of cumulative supergene metal enrichment at La Escondida, Atacama Desert, northern Chile. *Econ. Geol.* 84:229-255.

Alpers, C. N., K. M. Cunningham, R. W. Fujimura, B. J. Finlayson, and C. Huang, 1994, Geochemistry and toxicity of metal-rich sediment and associated pore waters in a reservoir receiving acid mine drainage: Keswick Reservoir, California. In *Eos, Transactions, American Geophysical Union* 75 (44, Suppl.), 237.

Alpers, C. N., S. N. Hamlin, and M. P. Hunerlach, 1999, Hydrogeology and geochemistry of acid mine drainage in ground water in the vicinity of Penn Mine and Camanche Reservoir, Calaveras County, California; summary report, 1993-1995, U.S. Geol. Survey Water Resour. Invest. Rept 96-4287, 59 pp.

Alpers, C. N., S. N. Hamlin, and R. O. Rye, 1994, Stable isotopes (O,H,S) distinguish sources of acid drainage at Penn Mine, California, M. A. Lanphere, G. B. Dalrymple, and B. D. Turrin, eds., *Abstracts of the Eighth International Conference on Geochronology, Cosmochronology, and Isotope Geology*, Berkeley, CA, U.S. Geol. Survey Circ. 1107, 4 pp.

Alpers, C. N., C. Maenz, D. K. Nordstrom, R. C. Erd, and J. M. Thompson, 1991, Storage of metals and acidity by iron-sulfate minerals associated with extremely acidic mine waters, Iron Mountain, California. *Geol. Soc. Am. Ann. Mtg.*, A383.

Alpers, C. N., and D. K. Nordstrom, 1990, Stoichiometry of mineral reaction from mass balance computations for acid mine waters, Iron Mountain, California. In *Acid Mine Drainage: Designing for Closure*. J. W. Gadsy, J. W. Malick and S. J. Day, eds. Geol. Assoc. Canada - Min. Assoc. Canada Ann. Mtg., Vancouver, B.C.: BiTech Publishers, 23-33.

Alpers, C. N., and D. K. Nordstrom, 1991, Geochemical evolution of extremely acid mine waters at Iron Mountain, California: Are there any lower limits to pH? Proc. 2nd International Conference on the Abatement of Acidic Drainage, vol. 2., Montreal, Quebec, Canada, 321-342.

- Alpers, C .N. and Nordstrom, D. K. (1999) Geochemical modeling of water-rock interactions in mining environments. In Reviews in Economic Geology, vol. 6A, The Environmental Geochemistry of Mineral Deposits. Part A. Processes, Methods and Health Issues, G.S.Plumlee and M.J. Logsdon, eds., 289-324.
- Alpers, C. N., D. K. Nordstrom, and J. W. Ball, 1989, Solubility of jarosite solid solutions precipitated from acid mine waters, Iron Mountain, California, U.S.A. Sci. Geol. Bull. 42:281-298.
- Alpers, C. N., D. K. Nordstrom, and J. M. Burchard, 1992, Compilation and interpretation of water-quality and discharge data for acidic mine waters at Iron Mountain, Shasta County, California, 1940-1991. U.S. Geol. Survey Water Resour. Invest. Rept. 91-4160, 173 pp.
- Alpers, C. N., D. K. Nordstrom, and J. M. Thompson, 1994, Seasonal variations of Zn/Cu ratios in acid mine waters from Iron Mountain, California. In The Environmental Geochemistry of Sulfide Oxidation. C. N. Alpers and D. W. Blowes, eds. Washington, D.C.: Am. Chem. Soc. Symp. Ser. 550, 324-344.
- Alpers, C. N., R. O. Rye, D. K. Nordstrom, L. D. White, and B. S. King, 1992, Chemical crystallographic and isotopic properties of alunite and jarosite from acid hypersaline Australian lakes. Chem. Geol. 96:203-226.
- Balistrieri, L. S., P. Edelmann, R. F. Ortiz, C. M. Moore, N. Nelson, and M. Wright, 1995, Metal fluxes across the sediment-water interface in Terrace Reservoir, Colorado. In Proc. Summitville Forum '95, H. H. Posey, J. A. Pendleton, and D. J. A. Van Zyl, eds., Colorado Geol. Survey Spec. Pub. 38, 216.
- Balistrieri, L. S., L. P. Gough, R. C. Severson, and A. S. Archuleta, 1995, The biogeochemistry of wetlands in the San Luis Valley, Colorado; the effects of acid drainage from natural and mine sources. In Proc. Summitville Forum '95, H. H. Posey, J. A. Pendleton, and D. J. A. Van Zyl, eds., Colorado Geol. Survey Spec. Pub. 38, 219-226.
- Ball, J. W., and D. K. Nordstrom, 1985, Major and trace-element analyses of acid mine waters in the Leviathan Mine drainage basin, California/Nevada, 1981 to October 1982. U.S. Geol. Survey Water Resour. Invest. Rept. 85-4169, 46 pp.
- Ball, J. W., and D. K. Nordstrom, 1989, Final revised analyses of major and trace elements from acid mine waters in the Leviathan Mine drainage basin, California and Nevada--October 1981 to October 1982. U.S. Geol. Survey Water Resour. Invest. Rept. 89-4138, 46 pp.
- Ball, J. W., and D. K. Nordstrom, 1994, A comparison of simultaneous plasma, atomic absorption, and iron colorimetric determinations of major and trace constituents in acid mine waters. U.S. Geol. Survey Water Resour. Invest. Rept. 93-4122, 151 pp.
- Ball, J. W., R. L. Runkel, and D. K. Nordstrom, 1999, Transport modeling of reactive and non-reactive constituents from Summitville, CO: Preliminary results from the application of OTIS/OTEQ to the Wightman Fork/Alamosa River system. In Proc. U.S. Geol. Survey Toxic Substances Hydrology Program, D. W. Morganwalp and H. T. Buxton, eds., U.S. Geol. Survey Water Resour. Invest. Rept. 99-4018A, 305-311.

- Barnes, I., and F. E. Clarke, 1964, Geochemistry of ground water in mine drainage problems. U.S. Geol. Survey Prof. Paper 473-A, 6 pp.
- Barnes, I., W. T. Stuart, and D. W. Fisher, 1964, Field investigation of mine waters in the Northern Anthracite Field, Pennsylvania. U.S. Geol. Survey Prof. Paper 473-B, 8 pp.
- Barry, T. H., VI, D. J. Bove, G. S. Plumlee, and J. A. Saunders, 1995, Geochemistry of natural waters draining hydrothermally altered and mineralized terrains in the upper Alamosa River basin, Colorado, Abstracts with Programs – Geol. Soc. Am. 27, 96.
- Bencala, K. E., D. M. McKnight, and G. W. Zellweger, 1987, Evaluation of natural tracers in an acidic and metal-rich stream. Water Resour. Res. 23, 827-836.
- Bencala, K. E., D. M. McKnight, and G. W. Zellweger, 1990, Characterization of transport in an acidic and metal-rich mountain stream based on a lithium tracer injection and simulations of transient storage. Water Resour. Res. 26, 989-1000.
- Bencala, K. E., D. M. McKnight, G. W. Zellweger, and J. Goad, 1986, The stability of rhodamine WT dye in trial studies of solute transport in an acidic and metal-rich stream. In Selected Papers in the Hydrologic Sciences. U.S. Geol. Survey Water Supply Paper 2270, 87-95.
- Bencala, K. E., D. M. McKnight, G. W. Zellweger, and B. A. Kimball, 1991, Monitoring acidic streams for transport studies. In U.S. Geological Survey Toxic Substances Hydrology Program - Surface-Water Contamination – Proc. of the Technical Meeting. G. E. Mallard, ed., U.S. Geol. Survey Open-File Rept. 87-764, 119-124.
- Bevans, H. E., 1980, A procedure for predicting concentrations of dissolved solids and sulfate ion in streams draining areas strip mined for coal. U.S. Geol. Survey Open-File Rept. 80-764, 17 pp.
- Blevins, D. W., 1991, Hydrology and water chemistry of an abandoned surface coal mine, southwestern Henry County, Missouri, 1984-1986. U.S. Geol. Survey Water Resour. Invest. Rept. 90-4047, 52 pp.
- Blevins, D. W., and D. T. Chafin, 1988, Determination of chemical processes in coal mine spoil in west-central Missouri using sulfur and oxygen isotopes. Symp. Mining, Hydrol., Sedimentol., and Reclam., 53-57.
- Blevins, D. W., and A. C. Ziegler, 1992, Effects of reclamation on water quality and geochemical processes in lakes in an abandoned surface coal mine in Henry County, Missouri – August 1988 - May 1990. U.S. Geol. Survey Water Resour. Invest. Rept. 92-4167, 65 pp.
- Bliss, L. N., C. M. Sellstone, A. D. Nicholson, and J. H. Kempton, 1997, Buffering of acid rock drainage by silicate minerals, R. B. Wanty, S. P. Marsh, and L. P. Gough, eds. In Proc. 4th International Symposium on Environmental Geochemistry; U.S. Geol. Survey Open-File Rept. 97-0496, 12 pp.
- BoBo, L. L., and S. E. Eikenberry, 1982, Water quality and other hydrologic data collected in and around surface coal mines, Clay and Vigo Counties, Indiana. U.S. Geol. Survey Open-File Rept. 82-639, 117 pp.

- Bove, D. J., A. B. Wilson, and T. H. Barry, 1996, Hydrothermal alteration assemblages as a control on water chemistry, upper Alamosa River, Colorado, R. A. Thompson, M. R. Hudson, and C. L. Pillmore, eds. Geologic excursions to the Rocky Mountains and beyond, Colorado Geol. Survey Spec. Pub. 44, 4.
- Boyles, J. M., D. Cain, W. Alley, and R. W. Klusman, 1974, Impact of Argo Tunnel acid mine drainage, Clear Creek County, Colorado. Am. Water Res. Assoc. J. 18:41-53.
- Brady, K. B. C., A. W. Rose, C. A. Cravotta, III, W. W. Hellier, 1997, Bimodal distribution of pH in coal mine drainage. Abstracts with Programs – Geol. Soc. Am. 29, 32.
- Brady, K. B. C., M. W. Smith, R. L. Beam, and C. A. Cravotta, III, 1990, Effectiveness of the addition of alkaline materials at surface coal mines in preventing or abating acid mine drainage; Part 2, Mine site case studies, J Skousen, J. Sencindiver, and D. Samuel, eds., Proc. of the 1990 Mining and Reclamation Conference and Exhibition, Charleston, WV, 227-241.
- Broshears, R. E., K. E. Bencala, B. A. Kimball, and D. M. McKnight, 1993, Tracer-dilution experiments and solute-transport simulations for a mountain stream, Saint Kevin Gulch, Colorado. U.S. Geol. Survey Water Resour. Invest. Rept. 92-4081, 18 pp.
- Broshears, R. E., B. A. Kimball, and R. L. Runkel, 1996, Simulation of reactive transport during a pH modification experiment in a mountain stream affected by acid mine drainage, D. W. Morganwalp, and D. A. Aronson, eds. In U.S. Geological Survey Toxic Substances Hydrology Program: Proc. of the Technical Meeting, U.S. Geol. Survey Water Resour. Invest. Rept. 94-4015, 781-788.
- Broshears, R. E., and R. L. Runkel, 1995, Interpreting spatial profiles of concentration in acid mine drainage streams, W. R. Hotchkiss, J. S. Downey, E. D. Gutentag and J. E. Moore, eds., Water Resources at Risk, American Institute of Hydrology, LL-10-LL-21.
- Broshears, R. E., R. L. Runkel, and B. A. Kimball, 1994, Development and application of a reactive solute transport model for trace metals in mountain streams. In Toxic Substances and the Hydrologic Sciences. American Institute of Hydrology, 19-34.
- Broshears, R. E., R. L. Runkel, B. A. Kimball, D. M. McKnight, and K. E. Bencala, 1996, Reactive solute transport in an acidic stream: Experimental pH increase and simulation of controls on pH, aluminum, and iron, Environ. Sci. Technol. 30:3016-3024.
- Brown, J. G., and J. H. Eychaner, 1996, Research of acidic contamination of ground water and surface water, Pinal Creek basin, Arizona, J. G. Brown, and B. Favor, eds., Hydrology and geochemistry of aquifer and stream contamination related to acidic water in Pinal Creek basin near Globe, Arizona, U. S. Geol. Survey Water Supply Paper 2466, 1-20.
- Brown, J. G., R. Brew, and J. W. Harvey, 1997, Research on acidic metal contaminants in Pinal Creek basin near Globe, Arizona, Fact Sheet – U.S. Geol. Survey, FS 0005-97, 4 pp.
- Callender, E. C., B. A. Kimball, W. H. Ficklin, and A. C. Sigleo, 1994, Preservation of heavy-metal inputs from acidic mine releases in bottom sediments from Pueblo Reservoir, Colorado. In Eos, Transactions, American Geophysical Union, 75 (44, Suppl.), 237.

Christenson, S. C., D. L. Parkhurst, and R. W. Fairchild, 1994, Geohydrology and water quality of the Roubidoux Aquifer, northeastern Oklahoma. U.S. Geol. Survey Circ. 96, 70 pp.

Church, S. E., 1994, Use of lead-isotopes to fingerprint sources of heavy-metal contamination in the environment. USGS Research on Mineral Resources - 1994, Programs and Abstracts, L. M. H. Carter, M. I. Toth and W. C. Day, eds. Ninth V.E. McKelvey Forum on Mineral and Energy Resources, Tucson, AZ. U.S. Geol. Survey Circ. 1103-A, 16-17.

Church, S. E., 1995, Delineating the effects of mineral-resource extraction and mineral processing in the environment. Abstract, 1995 Department of the Interior Conference on Environment and Safety.

Church, S. E., 1996, Indicators and discriminators used to separate metal sources from contrasting upstream mining district. SAGEEP volume.

Church, S. E., D. L. Fey, R. B. Vaughn, and D. A. Ferderer, 1996, Geochemical studies from the Animas River watershed, Colorado. Geol. Soc. Am. Ann. Mtg. vol. 28, A156.

Church, S. E., C. W. Holmes, P. H. Briggs, R. B. Vaughn, J. Cathcart, and M. Marot, 1993, Geochemical and lead-isotope data from stream and lake sediments, and cores from the upper Arkansas River drainage: effects of mining at Leadville, Colorado on heavy-metal concentrations in the Arkansas River. U.S. Geol. Survey Open-File Rept. 93-534, 61 pp.

Church, S. E., S. A. Wilson, and P. H. Brigg, 1995, Geochemical and lead-isotopic studies of stream and river Sediments, Alamosa River basin, Colorado. U.S. Geol. Survey Open-File Rept. 95-250, 71 pp.

Church, S. E., S. A. Wilson, S. M. Smith, R. B. Vaughn, P. H. Briggs, and D. L. Fey, 1994, Impact of mining activity on the geochemistry of active sediments in the upper Arkansas River, Colorado. In Eos, Transactions, American Geophysical Union 75 (44, Suppl.), 241.

Church, S. E., B. A. Kimball, D. L. Fey, D. A. Ferderer, T. J. Yager, R. B. Vaughn, 1997, Source, transport, and partitioning of metals between water, colloids, and bed sediments of the Animas River, Colorado, U.S. Geol. Survey Open-File Rept. 97-0151, 135 pp.

Church, S. E., S. A. Wilson, R. B. Vaughn, and D. L. Fey, 1994, Geochemical and lead-isotopic studies of river and lake sediments, upper Arkansas River drainage basin, Twin Lakes to Pueblo Reservoir, Colorado. U.S. Geol. Survey Open-File Rept. 94-412, 40 pp.

Corbett, R. G., D. J. Growitz, 1967, Composition of water discharge from bituminous coal mines in northern West Virginia. Econ. Geol. 62:848-851.

Cravotta, C. A. III, 1992, Effect of sewage sludge on formation of acidic water at reclaimed coal mines in western Pennsylvania. Geol. Soc.Am., Ann. Mtg., vol. 24, 14.

Cravotta, C. A. III, 1994, Secondary iron-sulfate minerals as sources of sulfate and acidity. In The Environmental Geochemistry of Sulfide Oxidation, C. N. Alpers and D. W. Blowes, eds., Am. Chem. Soc. Symp. Ser. 550, 345-364.

Cravotta, C. A. III, 1998, Effect of sewage sludge on formation of acidic ground water at a reclaimed coal mine. Ground Water, 36:9-19.

Cravotta, C. A. III, 1998, Oxie limestone drains for treatment of dilute, acidic mine drainage,.Annual Symposium of the West Virginia Surface Mine Drainage Task Force, Morgantown, WV.

Cravotta, C. A. III, K. C. Brady, L. C. Gustafson-Minnich, and M. R. DiMatteo, 1994, Geochemical and geohydrological characteristics of bedrock and spoil from two methods of mining at a reclaimed surface coal mine, Clarion County, PA, USA. International Land Reclamation and Mine Drainage Conference and the Third International Conference on the Abatement of Acidic Drainage, Pittsburgh, PA, U.S. Bureau of Mines Spec. Pub. 06B-94, 242-249, 125-130.

Cravotta, C. A. III, K. B. C. Brady, M. W. Smith, and R. L. Beam, 1990, Effectiveness of the addition of alkaline materials at surface coal mines in preventing or abating acid mine drainage; Part I, Geochemical considerations. J. Skousen, J. Sencindiver, and D. Samuel eds., Proc. of the 1990 Mining and Reclamation Conference and Exhibition, Charleston, WV, 221-225.

Cravotta, C. A. III, D. L. Dugas, K. B. C. Brady, and T. E. Kovalchuk, 1994, Effects of selective handling of pyritic, acid-forming materials on the chemistry of pore gas and ground water at a reclaimed surface coal mine, Clarion County, PA, USA. International Land Reclamation and Mine Drainage Conference and the Third International Conference on the Abatement of Acidic Drainage, Pittsburgh, PA, U.S. Bureau of Mines Spec. Pub.06B-94, 365-374.

Cravotta, C. A., III, and M. K. Trahan, 1999, Limestone drains to increase pH and remove dissolved metals from acidic mine drainage, Applied Geochem., 14:581-606.

Deacon, J. R., and N. E. Driver, 1999, Distribution of trace elements in streambed sediment associated with mining activities in the upper Colorado River basin, Colorado, USA, 1995-96, Archives of Environmental Contamination and Toxicology, 37:7-18.

Edelmann, P., R. F. Ortiz, L. S. Balistrieri, M. J. Radell, and C. M. Moore, 1995, Limnological characteristics of Terrace Reservoir, south-central Colorado, 1994, H. H. Posey, J. A. Pendleton, and D. J. A. Van Zyl, eds., Proc.; Summitville Forum '95, Colorado Geol. Survey Spec. Pub. 38, 218.

Erdman, J. E., and K. S. Smith, 1993, Impact of the Summitville Mine on irrigation water, agricultural soils, and alfalfa in the southwestern San Luis Valley, Colorado. U.S. Geol. Survey Open-File Rept. 93-616, 4 pp.

Erickson, B. M., P. H. Briggs, and T. R. Peacock, 1996, Metal concentrations in sedges in a wetland receiving acidic mine drainage from St. Kevin Gulch, Leadville, Colorado, D.W. Morganwalp, and D. A. Aronson, eds. In U.S. Geological Survey Toxic Substances Hydrology Program; Proc. of the Technical Meeting, 1993, U.S. Geol. Survey Water Resour. Invest. Rept. 94-4015, 797-804.

Erickson, B. M., P. H. Briggs, and T. R. Peacock, 1993, Metal concentrations in the wetland vegetation receiving acid mine drainage from St. Kevin Gulch, Leadville, Colorado. USGS research on mineral resources, 1994; Program and abstracts, L. M. H. Carter, M. I. Toth, and W. C. Day, eds., Ninth V. E. McKelvey Forum on Mineral and Energy Resources, Tucson, AZ, U.S. Geol. Survey Circular 1103-A, 33-34.

Erickson, B. M., P. H. Briggs, and T. R. Peacock , 1993, Metal composition of sedges collected on the wetland receiving acid mine drainage from St. Kevin Gulch, Leadville, Colorado, C. E. Baker, and A. B. Coury, eds., U.S. Geol. Survey Open-File Rept. 93-0680, 4 pp.

Erickson, B. M., P. H. Briggs, K. R. Kennedy, and T. R. Peacock, 1991, Analytical results for sedge samples collected on the wetland receiving acid mine drainage waters from St. Kevin Gulch, Leadville, Colorado, U.S. Geol. Survey Open-File Rept. 91-0126, 83 pp.

Erickson, B. M., P. H. Briggs, K. R. Kennedy, and T. R. Peacock, 1991, Chemical composition of the wetland vegetation receiving the acid mine drainage water of St. Kevin Gulch, Leadville, Colorado, G. E. Mallard, and D. E. Aronson, eds. In U.S. Geological Survey Toxic Substances Hydrology Program; Proc. of the Technical Meeting, U.S. Geol. Survey Water Resour. Invest. Rept. 91-4034, 419-421.

Evaldi, R. D., and R. Garcia, 1991, Quality of south fork Cumberland River near Stearns, Kentucky. Proc. of the Second International Conference on Abatement of Acidic Drainage, Montreal, Quebec, Canada, 417-434.

Eychaner, J. H., 1991, The Globe, Arizona, research site -- contaminants related to copper mining in a hydrologically integrated environment. G. E. Mallard and D. A. Aronson, eds. In U.S. Geological Survey Toxic Substances Hydrology Program. Proc. of the Technical Meeting, U.S. Geol. Survey Water-Resour. Invest. Rept. 91-4034, 439-447..

Ficklin, W. H., and K. S. Smith, 1994, Influence of mine drainage on Clear Creek, Colorado. K. C. Stewart, and R. C. Severson, eds., Guidebook on the geology, history, and surface-water contamination and remediation in the area from Denver to Idaho Springs, Colorado, U.S. Geol. Survey Circ.1097, 43-48.

Filipek, L. H., D. K. Nordstrom, and W. H. Ficklin, 1987, The interaction of acid mine drainage with waters and sediments of West Squaw Creek in the West Shasta Mining District, California. Environ. Sci. Technol. 21:388-396.

Finkelman, R. B., 1980, Modes of occurrence of trace elements in coal. Ph.D. thesis. P. 300. University of Maryland.

Finkelman, R. B., and D. E. Giffin, 1986, Hydrogen peroxide oxidation: An improved method for rapidly assessing acid- generating potential of sediments and sedimentary rocks. Recreation and Revegetation Research 5:521-534.

Fishel, D. K., 1988, Preimpoundment hydrologic conditions in the Swatara Creek (1981-1984) and estimated postimpoundment water quality in and downstream from the planned Swatara State Park Reservoir, Lebanon and Schuylkill Counties, Pennsylvania, U.S. Geol. Survey Water Resour. Invest. Rept. 88-4087, 108 pp.

Flohr, M J. K., R. G. Dillenburg, G. L. Nord., Jr., and G. S. Plumlee, 1995, Secondary mineralogy of altered rocks, Summitville Mine, Colorado, U.S. Geol. Survey Open-File Rept. 95-0808, 27 pp.

Gaccetta, J. D., and S. E. Church, 1989, Lead isotope data base for sulfide occurrences from Alaska, December, 1989. U.S. Geol. Survey Open-File Rept. 89-688, 60 pp.

- Gilbert, J. S., P. M. O'Meara, J. G. Crock, T. R. Wildeman, and G. A. Desborough, 1999, Adsorption capabilities of selected clinoptilolite-rich rocks as it relates to mine drainage remediation, U.S. Geol. Survey Open-File Rept. 99-0017, 50 pp.
- Goldfarb, R. J., S. W. Nelson, C. D. Taylor, W. M. d'Angelo, and A. L. Meier, 1996, Acid mine drainage associated with volcanogenic massive sulfide deposits, Prince William Sound, Alaska, T. E. Moore, and J. A. Dumoulin, eds., Geologic studies in Alaska by the U.S. Geological Survey, 1994, U.S. Geol. Survey Bull. 2152, 3-16.
- Goldhaber, M. B., 1983, Experimental study of metastable sulfur oxyanion formation during pyrite oxidation at pH-6-9 and 30°C. Am. J. Sci. 283:193-217.
- Gough, L. P., L. S. Balistrieri, F. E. Lichte, T. M. Yanosky, R. C. Severson, and A. Archuleta, 1996, The biogeochemistry of wetland ecosystems and tree rings in the San Luis Valley, Colorado; the effects of natural and human-induced metal-rich, acid drainage, History, geology, hydrogeology, Summitville Mine and downstream effects, and other nearby mines of the San Luis Valley, Colorado, Colorado Geol. Survey Open-File Report 96-4.
- Gough, L. P., L. S. Balistrieri, F. E. Lichte, T. M. Yanosky, R. C. Severson, and A. Archuleta, 1996, The biogeochemistry of wetland ecosystems and tree rings in the San Luis Valley, Colorado; the effects of natural and human-induced metal-rich, acid drainage, R. A. Thompson, M. R. Hudson, and C. L. Pillmore, eds., Geologic Excursions to the Rocky Mountains and Beyond, Colorado Geol. Survey Spec. Pub. 44, 7.
- Granger, H. C., and C. G. Warren, 1969, Unstable sulfur compounds and the origin of roll-type uranium deposits. Econ. Geol. 64:160-171.
- Granger, H. C., and C. G. Warren, 1974, Zoning in the altered tongue associated with roll-type uranium deposits. IAEA Pub. SM-183/6:185-200.
- Gray, J. E., M. F. Coolbaugh, G. S. Plumlee, and W. W. Atkinson, 1994, Environmental geology of the Summitville Mine, Colorado. Econ. Geol. 89:2006-2014.
- Growitz, D. J., L. A. Reed, and M. M. Beard, 1985, Reconnaissance of mine drainage in the coal fields of eastern Pennsylvania. U.S. Geol. Survey Water Resour. Invest. Rept. 83-4274, 54 pp.
- Gulson, B. L., S. E. Church, K. G. Mizon, and A. L. Meier, 1992, Lead isotopes in iron and manganese oxide coatings and their use as a guide for concealed mineralization. Appl. Geochem. 7:495-511.
- Hamlin, S. N., and C. N. Alpers, 1995, Hydrogeology and geochemistry of acid mine drainage in ground water in the vicinity of Penn Mine and Camanche Reservoir, Calaveras County, California; first-year summary, U.S. Geol. Survey Water Resour. Invest. Rept. 94-4040, 45 pp.
- Hamlin, S. N., and C. N. Alpers, 1996, Hydrogeology and geochemistry of acid mine drainage in ground water in the vicinity of Penn Mine and Camanche Reservoir, Calaveras County, California; second-year summary, 1992-93, U.S. Geol. Survey Water Resour. Invest. Rept. 96-4257, 44 pp.
- Hem, J. D., and C. Lind, 1993, Chemical processes in manganese oxide and carbonate precipitation in Pinal Creek, Arizona. In U.S. Geological Survey Toxic Substances Hydrology Program -

Abstracts. D. W. Morganwarp and D. A. Aronson, eds. U.S. Geol. Survey Open-File Rept. 93-454, 163 pp.

Horowitz, A. J., K. A. Elrick, and E. Callender, 1988, The Effect of mining on the sediment-trace element geochemistry of cores from the Cheyenne River Arm of Lake Oahe, South Dakota U.S.A. Chem. Geol. 67:17-33.

Kenny, J. F., and J. R. McCauley, 1983, Application of remote-sensing techniques to hydrologic studies in selected coal-mined areas of southeastern Kansas. U.S. Geol. Survey Water Resour. Invest. Rept. 83-4007, 33 pp.

Kilburn, J. E., D. B. Smith, and S. J. Sutley, 1999, Analytical results and conceptual model of mine drainage at the Holden Mine, Chelan County, Washington, U. S. Geol. Survey Open-File Rept. 99-0348, 36 pp.

Kilburn, J. E., S. J. Sutley, and C. G. Whitney, 1995, Geochemistry and mineralogy of acid mine drainage at the Holden Mine, Chelan County, Washington. Explore, 87; 10-14.

Kilburn, J. E., S. J. Sutley, and C. G. Whitney, 1995, Acid mine drainage at the Holden Deposit, Chelan County, Washington, U.S. Geol. Survey Open-File Rept. 95-0230, 11 pp.

Kimball, B. A., 1991, Physical, chemical, and biological processes in waters affected by acid mine drainage; from headwater streams to downstream reservoirs, G.E. Mallard, and D. A. Aronson, eds. In U.S. Geological Survey Toxic Substances Hydrology Program; Abstracts of the Technical Meeting, U.S. Geol. Survey Open-File Rept. 91-0088, 51 pp.

Kimball, B. A., 1991, Physical, chemical, and biological processes in waters affected by acid mine drainage; from headwater streams to downstream reservoirs, G.E. Mallard, and D. A. Aronson, eds. In U.S. Geological Survey Toxic Substances Hydrology Program; Proc. of the Technical Meeting, U.S. Geol. Survey Water Resour. Invest. Rept. 91-4034, 365-370.

Kimball, B. A., 1997, Use of tracer injections and synoptic sampling to measure metal loading from acid mine drainage, Fact Sheet – U.S. Geological Survey FS -0245-96, 4 pp.

Kimball, B. A., R. E. Broshears, K. E. Bencala, and D.M. McKnight, 1991, Comparison of rates of hydrologic and chemical processes in a stream affected by acid mine drainage, G.E. Mallard, and D. A. Aronson, eds. In U.S. Geological Survey Toxic Substances Hydrology Program; Proc. of the Technical Meeting, U.S. Geol. Survey Water Resour. Invest. Rept. 91-4034, 407-412.

Kimball, B. A., R. E. Broshears, K. E. Bencala, and D.M. McKnight, 1991, Comparison of rates of hydrologic and chemical processes in a stream affected by acid mine drainage, G.E. Mallard, and D. A. Aronson, eds., U.S. Geological Survey Toxic Substances Hydrology Program; Abstracts of the Technical Meeting, U.S. Geol. Survey Open-File Rept. 91-0088, 71 pp.

Kimball, B. A., R. E. Broshears, K. E. Bencala, and D.M. McKnight, 1992, Effect of instream pH modification on aluminum, Y. K. Kharaka, and A.S. Maest, eds., Proc. of the 7th International Symposium on Water-Rock Interaction; Volume I, Low Temperature Environments, 393-396.

Kimbball, B. A., R. E. Broshears, K. E. Bencala, and D.M. McKnight, 1994, Coupling of hydrologic transport and chemical reactions in a stream affected by acid mine drainage, Environ. Sci. Technol. 28:2065-2073.

Kimbball, B. A., R. E. Broshears, D. M. McKnight, and K. E. Bencala, 1994, Effects of instream pH modification on transport of sulfide-oxidation products. In The Environmental Geochemistry of Sulfide Oxidation. C. N. Alpers and D. W. Blowes, eds., Am. Chem. Soc. Symp. Ser. 550, 224-243

Kimbball, B. A. and E. Callender, 1992, Sediment-water exchange of metals influenced by colloids in a river receiving acid mine drainage, upper Arkansas River, Colorado. In Eos, Transactions, American Geophysical Union, 73 (43, Suppl.), 221.

Kimball, B. A., E. Callender, and E. V. Axtman, 1995, Effects of colloids on metal transport in a river receiving acid mine drainage, upper Arkansas River, Colorado, U.S.A. Appl. Geochem. 10:285-306.

King, T. V. V., ed., 1995, Environmental considerations of active and abandoned mine lands: Lessons from Summitville, Colorado, U.S. Geol. Survey Bull. 2220, 38 pp.

King, T. V.V., R. N. Clark, C. M. Ager, and G. A. Swayze, 1994, Mapping minerals and mine drainage using imaging spectroscopy data. In Eos, Transactions, American Geophysical Union, 75 (44, Suppl.), 242.

King, T. V. V., C. Clark Ager, R. N., G. A. Swayze, and A. J. Gallagher, 1994, Application of field and laboratory spectroscopic analysis to investigate the environmental impact of mining in the southeastern San Juan Mountains and adjacent San Luis Valley, Colorado. U.S. Geol. Survey Circ. 1103-A, 53-54.

Krishnaswamy, R., R. A. Hanger, and E. I. Robbins, 1997, Preliminary ecological and geochemical data for Virginia's Piedmont acidic mine drainage, its in situ phyco-microbial metal sinks and bioremediatory potentials. Abstracts with Programs – Geol. Soc. Am. 29, 29.

Kwong, Y. T. K. J., and D. K. Nordstrom, 1989, Copper-Arsenic mobilization and attenuation in an acid mine drainage environment. Abstract. Sixth Int. Water-Rock Interaction Symp. Malvern, Great Britain, 397-399.

Lee, G. K. 1996, Geoenvironmental assessment of Montana. Explore, 93:10, 20.

Lind, C. J., and J. D. Hem, 1993, Manganese minerals and associated fine particulates in the streambed of Pinal Creek, Arizona, USA; a mining-related acid drainage problem, Applied Geochem. 8:67-80.

Lopes, T. J., 1991, Effects of uranium mining, Puerco River, New Mexico. W. F. Ritter, ed., Proc. of the National Conference on Irrigation and Drainage Engineering, Honolulu, HI, 508-515.

McKnight, D. M., and K. E. Bencala, 1988, Diel variations in iron chemistry in an acidic stream in the Colorado Rocky Mountains, U.S.A. Arctic Alpine Res. 20:492-500.

- McKnight, D. M., and K. E. Bencala, 1989, Reactive iron transport in an acidic mountain stream in Summit County, Colorado: A hydrologic perspective. *Geochim. Cosmochim. Acta* 53:2225-2234.
- McKnight, D. M., K. E. Bencala, R. A. Harnish, and R. L. Runkel, 1993, Difficulties with intermediate-scale experiments for studies of iron chemistry in streams affected by acidic mine drainage, D.W. Morganwalp, and D. A. Aronson, eds. In U.S. Geological Survey Toxic Substances Hydrology Program; Proc. of the Technical Meeting, U.S. Geol. Survey Water Resour. Invest. Rept. 94-4015, 789-796.
- McKnight, D. M., and G. L. Feder, 1984, The Ecological effects of acid conditions and precipitation of hydrous metal oxides in a Rocky Mountain stream. *Hydrobiologia* 119:129-138.
- McKnight, D. M., B. A. Kimball, and K. E. Bencala, 1988, Iron photoreduction and oxidation in an acidic mountain stream. *Science* 240:637-640.
- Miller, W. R., J. B. McHugh, and A. L. Meier, 1995, Calculations of pre-mining geochemical baselines at three stream functions for Wightman Fork and Cropsy Creek near Summitville, Colorado. In Proc. Summitville Forum '95, H. H. Posey, J. A. Pendleton, and D. J. A. Van Zyl, eds., Colorado Geol. Survey Spec. Pub. 38, 58.
- Moore, J. N., and S. N. Luoma, 1990, Hazardous wastes from large-scale metal extraction. *Environ. Sci. Technol.* 24:1278-1285.
- Moran, R. E., and D. A. Wentz, 1974, Variations in metal content of the Kerber Creek Drainage, Colorado: An area affected by mining. Proc. 1st Int. Symp. Water-Rock Interact., 84-91.
- Moran, R. E., and D. A. Wentz, 1974, Thermodynamic constraints on metal solubilities in a stream affected by mine drainage, Bonanza, Colorado. Am. Water Resour. Assoc. 18:54-64.
- Moran, R. E., and D. A. Wentz, 1974, Effect of metal-mine drainage on water quality in selected areas of Colorado, 1972-1973. Colorado Water Resour. Circ. 25:250.
- Moses, C. O., D. K. Nordstrom, J. S. Herman, and A. L. Mills, 1985, Initiation of aqueous pyrite oxidation by dissolved oxygen and by ferric iron, Geol. Soc. Am. Ann. Mtg.
- Moses, C. O., D. K. Nordstrom, J. S. Herman, and A. L. Mills, 1987, Aqueous pyrite oxidation by dissolved oxygen and by ferric iron. *Geochim. Cosmochim. Acta* 51:1561-1571.
- Nash, J. T., 1999, Geochemical investigations and interim recommendations for priority abandoned mine sites, BLM lands, upper Animas River watershed, San Juan County, Colorado; paper edition, U. S. Geol. Survey Open-File Rept. 99-0323, 43 pp.
- Neaville, C. C., and J. G. Brown, 1994, Hydrogeology and hydrologic system of Pinal Creek basin, Gila County, Arizona, U.S. Geol. Survey Water Resour. Invest. Rept. 93-4214, 32 pp. (1 sheet).
- Nichols, V. E., 1983, Drift mine reclamation in Big Four Hollow near Lake Hope, Ohio - A preliminary data report. U.S. Geol. Survey Open-File Rept. 83-217, 115 pp.

- Nimick, D. A., and J. N. Moore, 1991, Prediction of water-soluble metal concentrations in fluvially deposited tailings sediments, Upper Clark Fork Valley, Montana, USA, *Appl. Geochem.* 6:635-646.
- Nimick, D. A., and P. von Guerard, eds., 1998, Science for watershed decisions on abandoned mine lands; review of preliminary results, U.S. Geol. Survey Open-File Rept. 98-0297, 71 pp.
- Niyogi, D. K., D. M. McKnight, and W. M. Lewis, Jr., 1995, Species composition and primary production of algae in a stream contaminated by acid mine drainage, *American Society of Limnology and Oceanography Ann. Mtg.*, 40.
- Nordstrom, D. K., 1977, Hydrogeochemical and microbiological factors affecting the heavy metal chemistry of an acid mine drainage system. Ph.D. Dissertation. P. 210. Stanford University.
- Nordstrom, D. K., 1982, Aqueous pyrite oxidation and the consequent formation of secondary iron minerals. In Acid Sulfate Weathering. J. A. Kittrick, D. S. Fanning and L. R. Hossner, eds. *Soil Sci. Soc. Am. Pub.*, 37- 56.
- Nordstrom, D. K., 1982, The effect of sulfate on aluminum concentrations in natural waters: Some stability relations in the system $\text{Al}_2\text{O}_3\text{-SO}_3\text{H}_2\text{O}$ at 298 K. *Geochim. Cosmochim. Acta* 46:681-692.
- Nordstrom, D. K., 1985, The rate of ferrous iron oxidation in a stream receiving acid mine effluent. In Selected Papers in the Hydrological Sciences. U.S. Geol. Survey Water Supply Paper 2270, 113-119.
- Nordstrom, D. K., 1985, The formation of acid mine waters: A review. In Proc. Hazardous Materials Management Conf. HAZMAT WEST '85, 453-457.
- Nordstrom, D. K., 1991, Chemical modeling of acid mine waters in the western United States. In Proc. U.S. Geol. Survey Toxic Substances Hydrology Program. G. E. Mallard and D. A. Aronson, eds. U. S. Geol. Survey Water-Resour. Invest. Report 91-4034, 534-538.
- Nordstrom, D. K., 1992, Geochemical modeling of acid mine waters from sulfide mineral deposits, Abstract, Thermodynamics of Natural Processes, TNP-2, Novosibirsk, Russia.
- Nordstrom, D. K., and C. N. Alpers, 1995, Remedial investigations, decision, and geochemical consequences at Iron Mountain Mine, California. T. P. Hynes, and M. C. Blanchette, eds., Sudbury '95; Mining and the environment; Sudbury, Ontario, Canada, Volume II, conference proceedings; acid mine drainage prevention and control; ground and surface water, 633-642.
- Nordstrom, D. K., and Alpers, C. N. (1999a) Negative pH, efflorescent mineralogy, and consequences for environmental restoration at the Iron Mountain Superfund site, California, *Proc. Nat'l. Acad. Sci.* 96:3455-3462.
- Nordstrom, D. K. and Alpers, C. N. (1999b), Geochemistry of acid mine waters. In *Reviews in Economic Geology*, vol. 6A, The Environmental Geochemistry of Mineral Deposits. Part A. Processes, Methods and Health Issues, G.S. Plumlee and M.J. Logsdon, eds., 133-160.
- Nordstrom, D. K., Alpers, C. N., Coston, J. A., Taylor, H. E., McCleskey, R. B., Ball, J. W., Davis, J. A., and Ogle, S. (1999) Geochemistry, toxicity, and sorption properties of contaminated sediments

and pore waters in two reservoirs receiving acid mine drainage from Iron Mountain, California, In Proc. U.S. Geol. Survey Toxic Substances Hydrology Program, D. W. Morganwalp and H. T. Buxton, eds., U.S. Geol. Survey Water-Resources Invest. Report 99-4018A, 289-296.

Nordstrom, D.K., Alpers, C.N., Ptacek, C.J. and Blowes, D.W. (2000) Negative pH and extremely acidic mine waters from Iron Mountain, California. Environ. Sci. Tech., 34:254-258

Nordstrom, D. K., and J. W. Ball, 1985, Toxic element composition of acid mine waters from sulfide ore deposits. Second Int. Mine Water Symp., Granada, Spain, 749-758.

Nordstrom, D. K., and J. W. Ball, 1986, The geochemical behavior of aluminum in acidified surface waters. Science 232:54-56.

Nordstrom, D. K., and J. W. Ball, 1989, Mineral saturation states in natural waters and their sensitivity to thermodynamic and analytical errors. Sci. Geol. Bull. 42:269-280.

Nordstrom, D. K., J. M. Burchard, and C. N. Alpers, 1990, The production and variability of acid mine drainage at Iron Mountain, California: A Superfund site undergoing rehabilitation, Abstract, Geol. Assoc. Canada –Min. Assoc. Canada Ann. Mtg., Vancouver, B.C.

Nordstrom, D. K., J. M. Burchard, and C. N. Alpers, 1990, The production and variability of acid mine drainage at Iron Mountain, California: A Superfund site undergoing rehabilitation. In Acid Mine Drainage-Designing for Closure. J. W. Gadsy, J. W. Malick and S. J. Day, eds. Geol. Assoc. Canada - Min. Assoc. Canada Ann. Mtg. Vancouver, B.C.: BiTech Publishers, 23-33.

Nordstrom, D. K., E. A. Jenne, and R. C. Averett, 1977, Heavy metal discharges into Shasta Lake and Keswick Reservoir on the upper Sacramento River, California: A reconnaissance during low flow. U.S. Geol. Survey Open-File Rept. 76-49, 25 pp.

Nordstrom, D. K., E. A. Jenne, and J. W. Ball, 1979, Redox equilibria of iron in acid mine waters. In Chemical Modeling in Aqueous Systems. E. A. Jenne, ed. Am. Chem. Soc. Symp. Series 93, 51-80.

Nordstrom, D. K., and H. M. May, 1996, Aqueous equilibrium data for mononuclear aluminum species. In The Environmental Chemistry of Aluminum, 2nd Edition, G. Sposito, ed., Boca Raton, FL, CRC Press, 39-80.

Nordstrom, D. K., R. H. McNutt, I. Puigdomenech, J. A. T. Smellie, and M. Wolf, 1992, Ground water chemistry and geochemical modeling of water-rock interactions at the Osamu Utsumi Mine and the Morro Do Ferro Analogue study sites, Poços de Caldas, Minas Gerais, Brazil. J. Geochem. Explor. 45:249-287.

Nordstrom, D. K., and G. A. Parks, 1987, Solubility and stability of scorodite: discussion. Am. Mineral. 72:849-851.

Nordstrom, D. K., and R. W. Potter, II, 1977, The interactions between acid mine waters and rhyolite. Second International Symposium on Water-Rock Interactions. Strasbourg, France, 15-26.

- Nordstrom, D. K., C. E. Roberson, J. W. Ball, and B. B. Hanshaw, 1984, The effect of sulfate on aluminum concentrations in natural waters: II. Field occurrences and identification of aluminum hydroxysulfate precipitates. *Geol. Soc. Am. Abstracts with Programs*, vol. 16, No. 6, 611.
- Nordstrom, D. K., and G. Southam, 1997, Geomicrobiology of sulfide mineral oxidation, J. F. Banfield, and K.H. Nealson, eds., *Geomicrobiology: interactions between microbes and minerals, Reviews in Mineralogy*, 35:361-390.
- Ott, A. N., 1986, Estimating iron and aluminum content of acid mine discharge from a north-central Pennsylvania coal field by use of acidity titration curves. *U.S. Geol. Survey Water Resour. Invest. Rept.* 84-4335, 25 pp.
- Ott, A. N., 1988, Dual-acidity titration curves - Fingerprint, indicator of redox state, and estimator of iron and aluminum content of acid mine drainage and related waters. *U.S. Geol. Survey Water-Supply Paper* 2330:19, 33 pp.
- Overly, B. M. and D. L. Lopez, 1997, Variations in chemical and bacterial species of acid mine drainage affecting the Snow Fork drainage basin, Ohio; the Esco underground mine. R. B. Wanty, S. P. Marsh, and L. P. Gough, eds., *Proc. 4th International Symposium on Environmental Geochemistry*; U.S. Geol. Survey Open-File Rept. 97-0496, 69 pp.
- Parkhurst, D. L., 1987, Chemical analyses of water samples from the Picher mining area, northeast Oklahoma and southeast Kansas, *U.S. Geol. Survey Open-File Rept.* 87-453, 43 pp.
- Parkhurst, D. L., 1992, The geochemical evolution of ground waters in the Central Oklahoma Aquifer. S. Christenson and L. Carpenter, eds. *Ground-water quality of the central Oklahoma (Garber-Wellington) aquifer conference*, U.S. Geol. Survey Open-File Report 92-116, 7-9.
- Parkhurst, D. L., S. C. Christenson, and J. L. Schlottmann, 1994, Ground-water-quality assessment of the Central Oklahoma Aquifer, Oklahoma--Analysis of available water-quality data through 1987. *U.S. Geol. Survey Water-Supply Paper* 2357B, 74 pp.
- Parkhurst, D. L., S. Christenson, and G. N. Breit, 1993, Ground-water quality assessment of the Central Oklahoma Aquifer, Oklahoma--Geochemical and geohydrologic investigations. *U.S. Geol. Survey Open-File Rept.* 92-642:, 113 pp.
- Pearce, N. J. G., R. Fuge, W. T. Perkins, and R. A. White, 1997, Behavior of heavy metals and REE in acid mine drainage; implications for the behavior of transuranic metals, R. B. Wanty, S. P. Marsh, and L. P. Gough, eds., *Proc. 4th International Symposium of Environmental Geochemistry*; U.S. Geol. Survey Open File Rept. 97-0496, 70 pp.
- Peiffer, S., K. Walton-Day, and D. L. Macalady, 1999, The interaction of natural organic matter with iron in a wetland (Tennessee Park, Colorado) receiving acid mine drainage, *Aquatic Geochemistry*, 5:207-223.
- Plumlee, G. S., K. S. Smith, and W. H. Ficklin, 1994, Geoenvironmental models of mineral deposits, and geology-based mineral-environmental assessments of public lands, *U.S. Geol. Survey Open File Rept.* 94-0203, 7 pp.

Plumlee, G. S., K. S. Smith, W. H. Ficklin, and P. H. Briggs, 1992, Geological and geochemical controls on the composition of mine drainages and natural drainages in mineralized areas, Kharaka, Y. K., and A. S. Maest, eds., Proc. 7th International Symposium on Water-Rock Interaction; Volume I, Low temperature environments 7, 419-422.

Plumlee, G. S., R. K. Streufert, K. S. Smith, S. M. Smith, A. R. Wallace, M. I. Toth, J. T. Nash, R. Robinson, W. H. Ficklin, and G. K. Lee., 1995, Map showing potential metal-mine drainage hazards in Colorado, based on mineral-deposit geology, Map Series – Colorado Geol. Survey, 29 (1 sheet).

Plumlee, G. S., et al., 1995, Geochemical Processes controlling acid-drainage generation and cyanide degradation at Summitville. Proc. Summitville Forum '95. H. H. Posey, J. A. Pendleton and D. Van Zyl, eds. Colorado Geol. Survey Spec. Pub. 38, 23-34.

Potter, R. W., II., 1976, The weathering of sulfide ores in Shasta County, California and its relationship to pollution associated with acid mine drainage. U.S. Geol. Survey Open-File Rept. 76-395, 17 pp.

Potter, R. W., II, and D. K. Nordstrom, 1977, The weathering of sulfide ores in Shasta County, California, USA, Second International Symposium on Water-Rock Interactions, Strasbourg, France, 142-146.

Reed, L. A., M. M. Beard, and D. J. Growitz, 1987, Quality of water in mines in the western middle coal field, anthracite region, east-central Pennsylvania. U.S. Geol. Survey Water Resour. Invest. Rept. 85-4038, 51 pp.

Robbins, E. I., 1999, Microbial and spectral reflectance techniques to distinguish neutral and acidic drainage, Fact Sheet - U.S. Geological Survey FS 0118-99, 4 p.

Robbins, E. I., J. E. Anderson, M. H. Podagsocki, H. M. Edenborn, J. R. Eggleston, D. Growitz, R. L. Kleinmann, A. W. Norden, M. E. Passmore, B. J. Prugh, Jr., M. R. Stanton, P. C. Sweet, and T. M. Vandyke, 1995, Red slime, oily films, and black rocks - Sensing the iron bacteria that make neutral streams look acid. In Energy and the Environment - Application of Geosciences to Decision-Making - Program and Short Papers. L. M. H. Carter, ed. Tenth V. E. McKelvey Forum on Mineral Resources. U.S. Geol. Survey Circ. 1108, 109-111.

Robbins, E. I., J. P. D'A gestino, J. Ostwald, D. S. Fanning, V. Carter, and R. L. Van Hoven, 1992, Manganese nodules and microbial oxidation of manganese in the Huntley Meadows Wetland, Virginia, USA. In Biomineralization Processes. H. C. W. Skinner and R. W. Fitzpatrick, eds. Germany: CATENA VERLAG, 179-202.

Robbins, E. I., G. L. Nords, Jr., C. E. Savela, J. I. Eddy, K. J. T. Livi, C. D. Gullett, D. K. Nordstrom, I. M. Chou, and K. M. Briggs, 1996, Microbial and mineralogical analysis of flocculates that occlude porosity in failed anoxic limestone drains fed by acid mine waters. In Crater Lakes, Terrestrial Degassing and Hyper-Acid Fluids in the Environment. S. H. Chiang, ed. 13th Annual International Pittsburgh Coal Conference., Crater Lake, Oregon, 26.

Robbins, E. I., C. A. Cravotta, III, C. E. Savela, G. L. Nord, Jr., K. A. Balciauskas, and H. E. Belkin, 1997, Hydrobiogeochemical interactions on calcite and gypsum in "anoxic" limestone drains in West Virginia and Pennsylvania, International Ash Utilization Symposium, Lexington, KY, 546-559.

- Robbins, E. I., C. A. Cravotta, III, C. E. Savela, and G. L. Nord, Jr., 1998, Hydrobiogeochemical interactions in "anoxic" limestone drains for neutralization of acidic mine drainage, *Fuel*.
- Runkel, R. L., and K. E. Bencala, 1995, Transport of reacting solutes in rivers and streams. In *Environmental Hydrology*. V. P. Singh, ed., Netherlands, 137-164.
- Runkel, R. L., K. E. Bencala, and R. E. Broshears, 1993, An equilibrium-based simulation model for reactive solute transport in small streams. U.S. Geol. Survey Water Resour. Invest. Rept. 94-4014, 10 pp.
- Runkel, R. L., and R. E. Broshears, 1991, One-dimensional transport with inflow and storage (OTIS): A solute transport model for small streams. CADWES Technical Rept. 91-01, 85.
- Runkel, R. L., D. M. McKnight, and K. E. Bencala, 1996, Reactive solute transport in streams 2. Simulation of a pH modification experiment. *Water Resour. Res.* 32:419-430.
- Rye, R. O., and C. A. Johnson, 1996, The use of stable carbon- and nitrogen-isotope data in quantifying cyanide degradation in mine drainage. *Abstracts with Programs – Geol. Soc. Am.* 28, 528.
- Rye, R. O., P. M. Bethke, and M. D. Wasserman, 1992, The stable isotope geochemistry of acid-sulfate alteration. *Econ. Geol.* 87:225-262.
- Sato, M., 1960, Oxidation of sulfide ore bodies, II, Oxidation mechanism of sulfide minerals at 25°C, *Econ. Geol.*, 55:1202-1231.
- Sato, M., 1960, Oxidation of sulfide ore bodies, I. Geochemical environments in terms of Eh and pH, *Econ. Geol.* 55:928-961.
- Sato, M., 1992, Persistency-field Eh-pH diagrams for sulfides and their application to supergene oxidation and enrichment of sulfide ore bodies. *Geochim. Cosmochim. Acta* 56:3133-3156.
- Scala, G., A. L. Mills, C. O. Moses, and D. K. Nordstrom, 1982, Distribution of autotrophic Fe and sulfur-oxidizing bacteria in mine drainage from sulfide deposits measured with the FAINT Assay. *Abstract. Ann. Mtg. Amer. Soc. Microbiol.*
- Seal, R. R., II, J. M. Hammarstrom, A. L. Meier, and M.J. K. Flohr, 1997, Controls on geochemical signatures of mine drainage from volcanic- and sediment-hosted massive sulfide deposits in the Eastern United States, *Abstracts with Programs – Geol. Soc. Am.*, 29, 386.
- Seitz, H. R., A. L. Van Denburgh, and R. J. La Camera, 1982, Ground-water quality downgradient from copper-ore milling wastes at Weed Heights, Lyon County, Nevada. U.S. Geol. Survey Open-File Rept. 80-1217, 51 pp.
- Severson, R. C., ed., 1991, Field trip guidebook for surface-water contamination and its remediation near Colorado, U.S. Geol. Survey Open-File Rept. 91-0426, 46 pp.
- Smith, K. S., 1994, Generation and interactions of mine drainage at the Argo Tunnel, K. C. Stewart and R. C. Severson, eds., *Guidebook on the geology, history, and surface-water contamination and*

remediation in the area from Denver to Idaho Springs, Colorado, U.S. Geol. Survey Circ. 1097, 39-41.

Smith, K. S., 1996, Use of computer models to predict metal mobility in mine-drainage systems; the importance of matching geochemical conditions, Abstracts with Programs – Geol. Soc.Am. 28, 528.

Smith, K. S., W. H. Ficklin, G. S. Plumlee, and A. L. Meier, 1992, Metal and arsenic partitioning between water and suspended sediment at mine-drainage sites in diverse geologic settings, Y. K. Kharaka, and A. S. Maest, eds., Proc. of the 7th International Symposium on Water-Rock Interaction; Volume, I, Low temperature environments 7, 443-447.

Smith, K. S., W. H. Ficklin, and J. F. Ranville, 1990, Examples and modeling of trace-metal water/sediment partitioning in Colorado streams affected by acid mine drainage, L. P. Gough, ed., Environmental Forum 1990; geoscience investigations that emphasize chemical, physical, and biological ecosystem processes, U.S. Geological Survey Open-File Rept 90-0288, 12. pp.

Smith, K. S., G. S. Plumlee, W. H. Ficklin, 1994, Predicting water contamination from metal mines and mining wastes; notes from a workshop presented at the International Land Reclamation and Mine Drainage Conference and the Third International Conference on the Abatement of Acidic Drainage, U.S. Geol. Survey Open-File Rept. 94-0264, 112 pp.

Smith, K. S., K. Walton-Day, 1990, Acid mine drainage and wetlands. C. E. Barker and A. B. Coury, compilers, U.S. Geol. Survey Open-File Rept. 90-0656, 16 pp.

Smith, K. S., et al., 1998, Trends in water-leachable lead from a fluvial tailings deposit along the upper Arkansas River, Colorado, Fifth International Conference on Tailings and Mine Waste 98, Fort Collins, CO, A.A. Balkema/Rotterdam, 763-768.

Smith, S. M., 1994, Geochemical maps of copper, lead, and zinc, upper Arkansas River drainage basin, Colorado. U.S. Geol. Survey Open-File Rept. 94-408, 15 pp.

Spruill, T. B., 1984, Assessment of water resources in lead-zinc mined areas in Cherokee County, Kansas, and adjacent areas. U.S. Geol. Survey Open-File Rept. 84-439, 102 pp.

Stogner, R. W., P. Edelman, and K. Walton-Day, 1996, Physical and chemical characteristics of Terrace Reservoir, Conejos County, Colorado, May 1994 through May 1995, U.S. Geol. Survey Water Resour. Invest. Rept. 96-4150, 57 pp.

Stokes, H. N., 1901, On pyrite and marcasite. U.S. Geol. Survey Bull. 186:50.

Stokes, H. N., 1907, Experiments on the action of various solutions on pyrite and marcasite. Econ. Geol. 2:14-23.

Stollenwerk, K. G., 1994, Geochemical interactions between constituents in acidic groundwater and alluvium in an aquifer near Globe, Arizona. Appl. Geochem. 9:353-369.

Tate, C. M., D. M. McKnight, and S. A. Spaulding, 1991, Phosphate uptake by algae in a stream contaminated by acid mine drainage, St. Kevin Gulch, Leadville, Colorado, G. E. Mallard, and D.

A. Aronson, eds. In U.S. Geological Survey Toxic Substances Hydrology Program, Abstracts of the Technical Meeting, U.S. Geol. Survey Open-File Rept. 91-0088, 55 pp.

Taylor, B. E., M. C. Wheeler, and D. K. Nordstrom, 1984, Stable isotope geochemistry of acid mine drainage: experimental oxidation of pyrite. *Geochim. Cosmochim. Acta* 48:2669-2678.

Taylor, B. E., M. C. Wheeler, and D. K. Nordstrom, 1984, Isotope composition of sulphate in acid mine drainage as a measure of bacterial oxidation. *Nature* 308:538-541.

Tibball, R. R., 1996, Geochemical dispersion in soils on the Alamosa River floodplain, San Luis Valley, Colorado; History, geology, hydrogeology, Summitville Mine and downstream effects, and other nearby mines of the San Luis Valley, Colorado. Colorado Geol. Survey Open-File Report, 96-4.

Tidball, R. R., S. M. Smith, and K. C. Stewart, 1994, Geochemical mapping in the San Luis Valley, Colorado hydrogeochemical and stream sediment data. U.S. Geol. Survey Circ. 1103-A, 105-106.

To, T. B., Nordstrom, D. K., Cunningham, K. C., Ball, J. W., McCleskey, R. B., 1999, New method for the direct determination of dissolved Fe(III) concentration in acid mine waters, *Environ. Sci. Tech.*, vol. 33, no. 5, 807-813.

Toler, L. G., 1982, Some chemical characteristics of mine drainage in Illinois. U.S. Geol. Survey Water-Supply Paper 2078.

Trainor, T. P., S. Fleisher, T. R. Wildeman, R. J. Goldfarb, and C. S. Huber, 1996, Environmental geochemistry of the McKinley Lake gold mining district, Chugach National Forest, Alaska, T. E. Moore, and J. A. Dumoulin, eds., *Geologic studies in Alaska by the U.S. Geological Survey*, 1994, U.S. Geol. Survey Bull. 2152, 47-57.

von Guerard, P., and R. F. Ortiz, 1995, Effects of sampling methods on copper and iron concentrations, Alamosa River, south-central Colorado, 1993, H. H. Posey, J. A. Pendleton, and D. J. A. Van Zyl, eds., Proc. Summitville Forum '95, Colorado Geol. Survey Spec. Pub. 38, 171-177.

Walton-Day, K., 1996, Iron and zinc budgets in surface water for a natural wetland affected by acidic mine drainage, St. Kevin Gulch, Lake County, Colorado, D. W. Morganwalp, and D. A. Aronson, eds. In U.S. Geological Survey Toxic Substance Hydrology Program; 1993, Proceedings of the Technical Meeting, U.S. Geol. Survey Water Resour. Invest. Rept. 94-4015, 759-764.

Walton-Day, K., and B. M. Erickson, 1990, Some effects of acid mine drainage on a subalpine wetland, Tennessee Park, Colorado, L. P. Gough, ed., Environmental Forum 1990, geoscience investigations that emphasize chemical, physical, and biological ecosystem processes, U. S. Geol. Survey Open-File Rept. 90-0288, 12. pp.

Walton-Day, K., B. A. Kimball, and T. J. Yager, 1994, The effects of remediation of mine drainage in the upper Arkansas River near Leadville, Colorado. In *Eos, Transactions, American Geophysical Union*, 75 (44, Suppl.), 237.

Walton-Day, K., R. F. Ortiz, and P. B. von Guerard, 1995, Sources of water having low pH and elevated metal concentrations in the upper Alamosa River from the headwaters to the outlet of Terrace Reservoir, south-central Colorado, April-September, 1993. Colorado Geol. Survey Spec. Pub. 38, 160-170.

- Walton-Day, K., R. L. Runkel, B. A. Kimball, and K. E. Bencala, 1998, Ground-water input of zinc to a watershed affected by acidic mine drainage; simulation results and implications for remediation; Cement Creek, upper Animas River watershed, Colorado, D. A. Nimick, and P. von Guerard, eds., Science for watershed decisions on abandoned mine lands; review of preliminary results, U. S. Geol. Survey Open File Rept. 98-0297, 35 pp.
- Ward, E. C., and K. Walton-Day, 1995, Seasonal variations in water quality on Wightman Fork of the Alamosa River, 1993. Colorado Geol. Survey Spec. Pub. 38, 183-190.
- Warren, C. G., 1969, Sulfur isotopes as a clue to the genetic geochemistry of a roll-type uranium deposit. Econ. Geol. 67:759-767.
- Webster, J. G., D. K. Nordstrom, and K. S. Smith, 1994, Transport and natural attenuation of Cu, Zn, As, and Fe in the acid mine drainage of Leviathan and Bryant Creeks. In The Environmental Geochemistry of Sulfide Oxidation. C. N. Alpers and D. W. Blowes, eds. Am. Chem. Soc. Symp. Ser. 550, 244-260.
- Webster, J. G., P. J. Swedlund, and K. S. Webster, 1997, Trace metal adsorption onto schwermannite (iron oxyhydroxysulfate) in acid mine drainage systems, R. B. Wanty, S. P. Marsh, and L. P. Gough, eds., Proc. 4th International Symposium on Environmental Geochemistry; U.S. Geol. Survey Open-File Rept. 97-0496, 96-97.
- Wentz, D. A., 1974, Stream quality in relation to mine drainage in Colorado. Am. Water Resour. Assoc. 18:158-173.
- Wentz, D. A., 1974, Effect of mine drainage on the quality of streams in Colorado. Colorado Water Resour. Circ. 21, 117.
- Wentz, D. A., 1977, Quantity and quality of drainage from the Argo Tunnel and other sources related to metal mining in Gilpin, Clear Creek, and Park Counties, Colorado. Water and Related Land Resources Management Study, vol. V - Supporting Technical Reports Appendices, Appendix F - USGS Mine Drainage Study, 60 pp.
- Wetherbee, G. A., B. A. Kimball, and W. S. Maura, Selected hydrologic data for the upper Arkansas River Basin, Colorado, 1986-89, U.S. Geol. Survey Open-File Rept. 91-0528, 216 pp.
- Wright, W. G. And Nordstrom, D. K. (1999) Oxygen isotopes of dissolved sulfate as a tool to distinguish natural and mining-related dissolved constituents. In Tailings and Mine Waste '99, Proc. Sixth Int. Conf. Tailings and Mine Waste '99, Fort Collins, CO, 671-678.
- Zellweger, G. W., K. E. Bencala, D. M. McKnight, R. M. Hirsch, and B. A. Kimball, 1988, Practical aspects of tracer experiments in acidic, metal enriched streams. In U.S. Geological Survey Toxic Substances Hydrology Program - Surface-Water Contamination – Proc. of the Technical Meeting. G. E. Mallard, ed., U.S. Geol. Survey Open-File Report 87-764, 125-130.